CLAIMS:

1. Apparatus for the collection and focusing of gas-phase ions and/or particles at or near atmospheric pressure, the apparatus comprising:

   a. a dispersive source of ions;

   b. a conductive high transmission surface populated with a plurality of holes through which ions pass unobstructed on the way to a collector target, aperture, or tube; the said surface being supplied with an attracting electric potential by connection to a voltage supply, and generating an electrostatic field between the source of ions and the top side of the surface; the said surface also being shaped to affect high focusing fields on the focusing side of the surface;

   c. a target surface for receiving ions or transmitting focused ions through target apertures, or tubes; said target surface held at a second ion-attracting and higher strength electric potential by connection to the voltage supply, and generating an electrostatic field between the underside of said surface and the orifice which has field lines that are concentrated on a relatively small cross-sectional target, aperture, or tube opening;

   d. an inner field-shaping electrode for focusing ions exiting the underside of said surface whereby approximately all ions are focused toward a small cross-sectional area on the said target surface.

2. Apparatus as in claim **1** wherein the target surface comprises a conductive end of a capillary tube.

3. The apparatus of claim **1** wherein said inner field-shaping electrode is a metal electrode whereby said electric potential from said target surface penetrates into the focusing region between the backside of said surface and said metal electrode through a single central aperture.

4. The apparatus of claim **1** wherein said inner field-shaping electrode is a metal electrode held at the same potential as the high transmission surface.

5. The apparatus as in claim **1** further including an analytical apparatus in communication with the target surface aperture or tube, wherein the aperture is interposed between the underside of said target surface and the analytical apparatus, said small cross-sectional area of ions being directed through the aperture into said analytical apparatus.

6. Apparatus as in claim **5** wherein said analytical apparatus comprises a mass spectrometer.

7. Apparatus as in claim **5** wherein said analytical apparatus comprises an ion mobility spectrometer.

8. Apparatus as in claim **1** wherein said gas-phase ions are formed by means of atmospheric or near atmospheric ionization sources such as, electrospray,

atmospheric pressure chemical ionization, atmospheric laser desorption, photoionization, discharge ionization, inductively coupled plasma ionization.

9. Apparatus of claim **8** wherein said atmospheric or near atmospheric ionization source is made up of a plurality of said atmospheric or near atmospheric ion sources operated simultaneously or sequentially.

10. Apparatus of claim **1**, wherein said target surface, is made up of a plurality of said focal points resulting from mechanical variation of said inner field-shaping electrode position and shape. Ions or charged particles collected at the focal points being accumulated onto the target surface for collection or passed through apertures and tubes for analysis.

11. Apparatus in claim **1** further including a pure gas supplied in such a way between the target surface and inner field-shaping electrode, or between the inner field-shaping electrode and the said high transmission surface, whereby substantially all said gas flows into the focusing region and through the plurality of holes in said surface.

12. An apparatus in claim 1 further including an outer field-shaping electrode surrounding the circumference of the high transmission surface; said outer field-shaping electrode held at a potential the same or slightly above the potential on the high transmission surface, said outer field-shaping electrode functioning to shield the outer surface of the high transmission surface from

high fields found in some needle containing source regions that suppress field penetration from the focusing region potentials into the source region.

13. Apparatus for the collection and focusing of an aerosol of gas-phase charged particles or droplets at or near atmospheric pressure, the apparatus comprising:

a. a source of charged droplets or particles

b. a conductive high transmission surface with a plurality of holes through which charged droplets pass unobstructed on the way to a target surface, the high transmission surface being supplied with an attracting electric potential by connection to a voltage supply, and generating an electrostatic field between the source of charged droplets, from an atmospheric ionization source, and the top side of said high transmission surface;

c. a target surface for receiving droplets, the said target surface being supplied with a second ion-attracting and higher strength electrical potential by connection to the voltage supply, and generating an electrostatic field between the underside of said surface and the target whereby electric field lines are concentrated to a small cross-sectional area on the target surface;

d. an inner field-shaping electrode for focusing charged particles exiting the underside of said surface whereby approximately all charged droplets are focused onto said target surface.

14. The apparatus of claim 13 wherein said inner field-shaping electrode is a metal electrode whereby said electric field from said target surface penetrates into a focusing region between the backside of said surface and

said field-shaping electrode through a central aperture in the inner field-shaping electrode.

15. The apparatus of claim **13** wherein the charged droplets and particles are formed by means of atmospheric ionization sources, such as, electrospray, discharge ionization, electron capture ionization, and inductive charging.

16. The apparatus of claim **15** wherein the atmospheric or near atmospheric ionization source is made up of a plurality of sources.

17. The apparatus of claim **13** wherein the target surface is made up of a plurality of targets whereby position and time dependence of focal points are determined by variation in inner field-shaping electrode geometry, position and potential.

18. A Method for the transfer of charged particles and/or ions from a highly dispersive area at or near atmospheric pressure and focusing approximately all charged particles and ions into an aperture for gas-phase ion analysis, the method comprising:

a. providing electrical attraction to ions and charged particles with electrostatic fields provided by a high transmission surface, the surface having an ion drawing potential, such that electrostatic field lines between the source of gas-phase ions or charged particle and said surface are concentrated on the top side of said surface;

b. transmitting ions through said high transmission surface by allowing the unobstructed passage into a focusing region by providing a plurality of holes in said high transmission surface with low depth aspect ratio, a high openness aspect ratio, and a high electrical potential ratio between the backside of said high transmission surface and a target surface, and;

c. providing electrostatic attraction to said ions in the focusing region with a second electrostatic field generated by said target surface, the target surface having an ion-drawing potential such that electrostatic field lines between the backside of said surface and aperture are concentrated onto the target surface urging approximately all ions or charged particles in focusing region to be directed towards said target surface whereby approximately all ions and charged particles flow into a small cross-sectional area.

19. Method as in claim **18**, wherein providing the transfer of charged particles or ions from dispersive sources for gas-phase ion analysis, comprises said inlet aperture at the focal point of the focal region so that a substantial fraction of ions or particles are transmitted to an analytical system such as a mass spectrometer or ion mobility spectrometer.

20. Method as in claim **18**, wherein providing the transfer of charged particles or ions from dispersive sources for gas-phase ion analysis, comprises a means of additional electrostatic focusing to said ions in the focusing region, the said additional focusing having an ion-drawing potential such that said electrostatic field lines are primarily concentrated on the aperture whereby approximately all said particles or ions are urged into an aperture on said target surface.

21. Method as in claim **18**, wherein providing the transfer of charged particles from dispersive sources for gas-phase ion analysis, comprises an inlet aperture of an atmospheric pressure interface of a mass spectrometer.

22. Method as in claim **18**, wherein providing the transfer of charged particles from dispersive sources for gas-phase ion analysis, comprises a plurality of focal points on the target surface.

23. Method as in claim **18**, wherein providing the transfer of charged particles from dispersive sources for gas-phase ion analysis, comprises an inlet aperture of an ion mobility spectrometer.

24. Method as in claim **18**, wherein providing the transfer of charged particles from dispersive sources for gas-phase ion analysis, comprises a plurality of dispersive sources of said ions or charged particles.

25. Method as in claim **18** wherein said electric field ratio at points equidistant from the upstream and downstream surface of the high transmission surface is greater than 10 to 1 with the focusing side (downstream) having the greater magnitude.

26. Method as in claim **18** further comprising feeding a pure gas in such a way between the aperture and focusing lens in focusing region, or between the focusing lens and the surface, whereby approximately all said gas passes into the

focusing region and through the plurality of holes in said surface preventing larger particles from crossing the surface of the high transmission element from the source region to the focusing region.